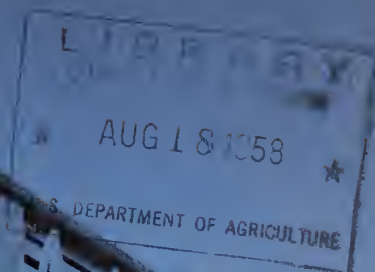


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Causes of Losses in Trucking Livestock

BY JOSEPH E. RICKENBACKER

FARMER COOPERATIVE SERVICE

U. S. DEPARTMENT OF AGRICULTURE

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The Farmer Cooperative Service conducts research studies and service activities of assistance to farmers in connection with cooperatives engaged in marketing farm products, purchasing farm supplies, and supplying business services. The work of the Service relates to problems of management, organization, policies, merchandising, product quality, costs, efficiency, financing, and membership.

The Service publishes the results of such studies, confers and advises with officials of farmer cooperatives; and works with educational agencies, cooperatives, and others in the dissemination of information relating to cooperative principles and practices.

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This study was conducted under authority of the Agricultural Marketing Act of 1946 (RMA, Title II).

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SUMMARY

A Farmer Cooperative Service study of approximately 6,500 motor vehicles transporting livestock to eight midwestern and western markets discloses that certain practices and conditions are closely associated with the injury and death of livestock in transit.

Knowing what causes these losses and then instituting programs to reduce them is vitally important to livestock shipping and marketing cooperatives, as these associations depend largely on motortruck transportation.

The combined dead and cripple loss per 10,000 head of livestock, on the basis of all livestock included in this survey, was: cattle, 5.06; calves, 20.10; hogs, 11.67; and sheep, 18.17. Over half of all the dead and crippled animals were in the mixed loads.

Based on 1956 average prices and average live weights as determined by Agricultural Marketing Service, U. S. Department of Agriculture, the dollar loss represented by the dead and crippled animals actually observed during this study was \$7,671.

If all the livestock received by motortruck at the 60 major public stockyards in the United States during 1956 had been subjected to the same loss rates per 10,000 head, the dollar loss on the national receipts would have approximated \$100 million. Obviously, programs to eliminate loss associated conditions are not only worthwhile--they are vitally essential.

This survey showed various conditions and practices had a positive relationship to injury and death of animals in transit. These included the number of animals in the load and their positioning in the vehicle,

type and quantity of bedding used, adequacy of ventilation, use made of partitions, horned animals included and their relationship to other animals in the truck, general condition of the vehicle with particular attention to the interior of the rack, vehicle end gates, and practices of drivers in handling animals during the unloading at market.

One or more of these "loss-associated conditions" were observed in over 90 percent of the truckloads of animals containing dead and/or crippled livestock in this survey.

All of the dead and crippled livestock received at the markets in the vehicles covered in this survey were contained in only 3.43 percent of the total number of vehicles. But in 93 percent of this limited number of trucks, one or more loss-associated conditions were observed. Handling abuses were observed in 59 percent; 34 percent were improperly bedded; 25 percent had improper ventilation; and 29 percent were either obviously overcrowded or too loosely loaded. About 45 percent of these "loss trucks" had failed to use partitions when and where needed for safe movement of the livestock.

In two-thirds of the cases, two or more of the loss-associated conditions were present.

This positive identification of the relationship of specific conditions and practices generally prevailing during the truck movement of livestock and losses in transit can provide a point of departure for developing effective programs to reduce livestock losses in transit.

The survey was conducted in the fall of 1956 during the peak period of receipts at the various markets. A two-man team made observations

on 10 principal market days at each market during the hours of heaviest unload activity. They watched over 133,000 head of livestock of the several species brought into the markets in trucks and trailers. These deliveries accounted for from 10 to 90 percent of total receipts and unloads arriving at these markets on the days the survey was conducted--the average for most markets was over 60 percent.

About 30 percent of the total number of animals arrived in mixed loads; that is two or more species were transported in the same vehicle. Almost twice as many calves (69 percent) arrived in mixed loads as did any of the other species. Roughly half the animals were transported in regular farm trucks equipped with stock racks and about one-fourth were moved in semitrailers. From 50 to 70 percent of the livestock, depending on species, were hauled less than 100 miles from farm or feed lot to market. Less than 5 percent, regardless of species, were transported over 300 miles.

Almost 25 percent of the vehicles were improperly loaded; that is the number of animals in the vehicle was such that they were either overcrowded or so lightly loaded as to permit shifting. Of these improperly loaded vehicles, 2 were obviously overcrowded to every 3 that were loaded too loosely.

Many types of bedding were observed. Sand and straw were the most common, either alone or in combination, but wood shavings, sawdust, and waste insulating material were used to some extent. About 30 percent of the total number of vehicles were inadequately bedded or had no bedding at all. Several hundred trucks, mostly mixed loads and loads comprised entirely of cattle, arrived at market with extremely slippery floors.

Whether or not partitions were used in mixed loads was influenced to a rather marked degree by the policy of various yard companies on unloading various species. Where separate unloading areas were provided for each species, partitioning was fairly common; otherwise the usual practice was to commingle the species. Overall, about half the mixed loads were partitioned. Partitions were used in single species loads for other purposes, such as to isolate bulls and horned animals and to obtain better positioning of animals within the vehicle.

Horned animals were observed in over one-fourth of all straight loads of cattle and in one-fifth of the mixed loads in which any cattle were present. Unfortunately, in only a very limited number of instances were these horned animals segregated from the rest of the load by partitions.

Except for pickup trucks, where wide end gates were the rule, almost 90 percent of the vehicles were equipped with end gates only wide enough to permit livestock to safely leave the vehicle one at a time. In many cases, these narrow end gates were constructed with open angle irons as an integral part of the gate assembly. The disturbing factor in this particular situation was that the angle iron was so located that unless the animals left the truck cautiously and in an orderly manner, their sides could easily strike the sharp edges of the irons.

The use of persuaders such as canes, whips, clubs, and electric prods was widespread. Other abuses, such as forcing animals to jump from upper decks, kicking animals, and hurrying livestock out of the truck during unloading, were observed. The incidence of these abuses was greatest in the case of mixed loads and straight loads of hogs.

Causes of Losses in Trucking Livestock

by Joseph E. Rickenbacker
Transportation Branch
Management Services Division

Cooperative livestock shipping and marketing associations are gravely concerned over high losses of animals moved to market by truck because their operations depend particularly on this type of transportation.

Back in 1956, Farmer Cooperative Service completed a survey of receipts of livestock at 10 major western and midwestern public stockyards. This study considered receipts transported by both rail and truck. It found that losses ran considerably higher in truck receipts than in shipments moving by railroad.

Since motortrucks now handle from 80 to 90 percent of all shipments of the various species of livestock moving to market or processing plant from farms and feed lots, the higher rate of loss found in truck shipments becomes even more significant.

For this reason, Farmer Cooperative Service made this survey devoted exclusively to motortruck movement of livestock.

The current study evaluated the influence of equipment, loading conditions, and handling practices on injury or death of animals moved by truck. By this means, it was hoped to establish the connection between livestock losses in transit and the particular conditions prevailing during transportation of animals from farms to markets or processing plants. The positive identification of what might best be termed "loss-associated" conditions can help greatly in developing programs to reduce these marketing losses.

This report will cover in some detail the results of observations of these "loss-associated" conditions--overcrowding, light and shifting loads, improper bedding, lack of partitioning, horned animals in loads, end gates with open angle irons, and certain handling abuses.

Survey Methods

A tentative survey procedure was drawn up and tested at a major midwestern market in May 1956. This pretest was run over a 6 weeks' period under conditions that offered a wide range of possible situations. At various times during the pretest, changes were made in the procedure to determine the best possible methods for obtaining data that would define differences as clearly as possible. After the May experiments, the results were analyzed and some further refinements made in the survey techniques. The procedure used in the actual survey was not adopted in final form until suggestions of marketing agencies, truckers, and

other interested groups were fully considered.

The survey was then conducted at eight major midwestern and western stockyards during the fall of 1956. It was timed to coincide with the peak period for receipts of the greatest number of species at the various markets. Two men--called enumerators for this report--spent 2 weeks at each market, working on each of the 10 principal market days falling in that period. They were usually on duty during the hours the greatest number of animals were unloaded at the yards. In one or two cases, an enumerator had to be present at other times to

check trucks that hadn't arrived during the peak period of the day.

Figure 1 shows the card form on which all data obtained during the survey was recorded. The data came entirely from observation--no questions being asked of the drivers. The enumerators, stationed at the principal unloading docks of the yard, filled out the cards on the greatest number of trucks possible. At some markets various species were unloaded at different points within the yard. At others several different unloading areas were of equal importance, and survey time was apportioned accordingly.

Decisions on stationing enumerators and allocation of survey time at the

particular locations were made on the basis of advice of personnel charged with receipt of livestock at the yards.

The enumerators worked in pairs. One man watched the actual unloading of the animals and obtained the head count, load condition, and origin of the shipment. The other man scrutinized the vehicle itself. Working together, they were able to obtain all the information required to fill out the card form during the time it took to back the truck up to the dock and unload the animals. Some of the criteria were obvious; other standards required decision-making as will be explained in later sections of this report.

CATTLE		CALVES		HOGS		SHEEP		Date		Market	
								A.M.			
								P.M.			
Dead		Dead		Dead		Dead		WEATHER			
Crip		Crip		Crip		Crip					
Origin of Shipment						Mileage		TEMPERATURE			
						Code					
LOAD FACTOR (LCI Rec.)		O.K. OVER LIGHT SHIFTING		Species		YES		HUMIDITY			
				Horns		NO					
				Bulls				WIND			
				Loading Aid							
VENTILATION		HORNS		One		BEDDING		HANDLING			
Slats { 1-4 1-2 3-4 All				Few Many		Adequate Skimpy					
Bottom Slats		Narrow		Wide		Straw		Canes			
Mech.		Angle Irons				Sand					
Front Vents { Open Closed		VEHICLE (BOX) CONDITION				None		Prods			
Top						Other (Specify)					
		Check () if O.K.				Slippery Floor		Whips			
		For Hire		Private							
TRAILER		SEMI		STRAIGHT TRUCK		SMALL TRUCK		PICK UP		REMARKS	

TO BE COMPLETED BY OBSERVATION-NO ORAL INTERVIEW

FIGURE 1

Types of Vehicles

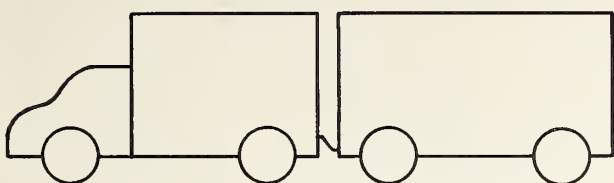
Many different types of vehicles transport livestock to market. For this study, it was necessary to group these into a limited number of broad categories. The various categories finally established are shown at the bottom of the face side of the survey card shown as figure 1 and are illustrated by the sketches in figure 2. Truck sizes varied within each of these categories but the type of vehicle was the major factor considered in most cases. Designations given the types or classes of vehicles were made on a somewhat arbitrary basis but one that at the same time was fairly descriptive and easily

understood. A few additional comments on these classes should help to adequately identify the vehicle types:

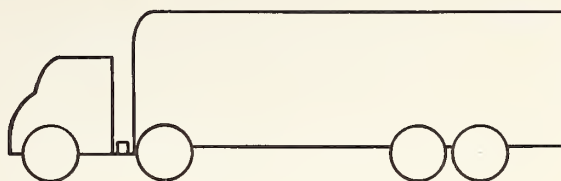
Trailer--Large trailers pulled by a tractor truck with the trailer riding on its own wheels rather than one end being carried on the rear of the tractor. Actually, this type of trailer was not observed to any appreciable degree except in cases where it was pulled by a full truck rather than a truck-tractor alone.

Semi--Applies to semitrailers--one end (forward) supported by the truck

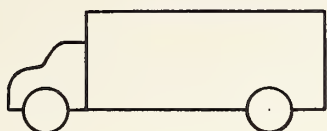
TYPES OF VEHICLES USED TO TRANSPORT LIVESTOCK TO EIGHT PUBLIC STOCKYARDS, SEPTEMBER-DECEMBER 1956



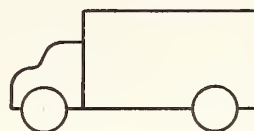
TRUCK AND FULL TRAILER



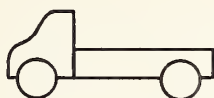
SEMITRAILER



STRAIGHT TRUCK



SMALL TRUCK



PICKUP



"PUP" TRAILERS

FIGURE 2

tractor. Usually with tandem wheels. All sizes included.

Straight Truck--The truck usually denoted as a farm truck equipped with a multipurpose body adaptable for livestock transportation. Stake-type body with slats available for insertion to form tight box.

Small Truck--A truck of the same general type as straight truck but with a much smaller body.

Pickup--Pickup trucks of all types. This category also included "pup" trailers--small trailers attached to passenger cars, horse trailers, and the like. In general it encompassed all vehicles capable of transporting a maximum of 2 or 3 cattle.

There was no difficulty in assigning any of these vehicles observed to one of the classes or categories pictured in figure 2 and just described.

Volume of Receipts and Shipments

The 6,421 vehicles included in the sample hauled 133,648 head of livestock of various species to the eight public stockyards at which this survey was conducted. Of the total receipts, about 37 percent were hogs, 36 percent were cattle, 18 percent were sheep, and 9 percent were calves. Depending on the size of the market, the number of animals and the number of vehicles included in the survey ranged from 10 percent to above 90 percent of total receipts and unloads arriving at the markets during the time the survey was conducted.

Table 1 shows type and number of vehicles used. As might have been expected, the regular standard farm

truck with a multipurpose slatted body accounted for slightly over half (51 percent) of all the vehicles observed (table 2). Semitrailers represented almost 23 percent of the total and a like number was about equally divided between smaller sized farm trucks and pickup trucks or small trailers. Combinations of regular trucks and full trailers accounted for the remaining 3 percent of the vehicles.

The geographical location of the public markets was reflected in the type of vehicle used. For example, the combination type vehicle was almost exclusively observed at the far western markets. State regula-

TABLE 1.--TYPES AND NUMBERS OF VEHICLES USED IN TRANSPORTING LIVESTOCK TO EIGHT PUBLIC STOCKYARDS, SEPTEMBER-DECEMBER 1956

Type of vehicle	Total	Mixed loads	Straight (single species) loads			
			Cattle	Calves	Hogs	Sheep
Truck and full trailer	176	22	134	1	11	8
Semitrailer	1,463	313	908	43	147	52
Straight truck	3,298	1,160	1,363	108	511	156
Small truck	763	168	329	81	139	46
Pick up truck or "pup" trailer	721	49	223	81	276	92
Total	6,421	1,712	2,957	314	1,084	354

TABLE 2.--PERCENTAGE DISTRIBUTION OF TOTAL RECEIPTS (INCLUDING MIXED LOADS) OF LIVESTOCK TRANSPORTED BY DIFFERENT TYPES OF MOTOR VEHICLES TO EIGHT PUBLIC STOCKYARDS, SEPTEMBER-DECEMBER 1956

Species	Truck and full trailer	Semi-trailer	Straight truck	Small truck	Pickup truck or "pup" trailer	Total
Percent						
Cattle	8.4	51.2	34.4	5.2	.8	100.0
Calves	1.2	32.1	52.6	12.0	2.1	100.0
Hogs	1.8	37.0	51.8	5.4	4.0	100.0
Sheep	7.3	43.4	38.2	6.4	4.7	100.0
All species	2.7	22.8	51.4	11.9	11.2	100.0

tions do not permit this type of conveyance in many instances. The pickup trailer is also a familiar sight on western highways. In those areas where large scale feedlot operations exist, semitrailers were especially numerous. Shipments from these feeders are generally of such size that larger vehicles are the most practical.

Size of the particular shipment (which may indicate the scale of operations of the patrons of a given market) and the characteristics of the various species may determine the type vehicle used in moving the animals in many instances. Except for a few isolated cases, the smaller pickup trucks and "pup" trailers were used to haul only one animal. A farmer with one cow to sell might well bring it to market in a rented "pup" trailer attached to the rear of his family car. But, if he had 6 or 8 steers to sell, he probably used his larger farm truck or hired a commercial livestock hauler who operated a larger vehicle rather than make several trips to and from the market.

Frequently, commercial truckers or cooperative shipping associations pro-

vide at-the-farm pickup service for small lots of animals and consolidate several of these for final movement to the market. This pickup service may be made in small vehicles and the animals transferred to a larger one later. Most frequently, however, the large vehicle that will be used for the final haul will perform all the service. In any case, the prevalence of this type of coordinated shipping reduces the number of smaller vehicles arriving at the market.

Table 3 indicates receipts in numbers of livestock by types of vehicles. From these numbers, certain percents can be calculated. For example, about 30 percent of the total number of animals arrived at market in mixed loads--that is, two or more species were transported in the same vehicle. The several species varied considerably as to the percentage transported in mixed loads. While 69 percent of the calves were in mixed loads, only 36 percent of the hogs, 24 percent of the sheep, and 18 percent of the cattle were so transported.

Likewise, about 27 percent of all vehicles brought in mixed loads (table 1). Again there was a variation, this

TABLE 3.--TOTAL RECEIPTS OF LIVESTOCK (by types of) VEHICLES AT EIGHT PUBLIC STOCKYARDS
SEPTEMBER-DECEMBER 1956

Species	Total all vehicles		Type of vehicle									
			Truck and full trailer		Semi- trailer		Straight truck		Small truck		Pickup truck or "pup" trailer	
	Mixed loads	Straight (single species) loads	Mixed loads	Straight (single species) loads	Mixed loads	Straight (single species) loads	Mixed loads	Straight (single species) loads	Mixed loads	Straight (single species) loads	Mixed loads	Straight (single species) loads
Number of head												
Cattle	8,509	39,349	337	3,681	3,087	21,412	4,509	11,958	529	1,945	47	353
Calves	8,502	3,806	83	61	2,802	1,153	4,972	1,498	585	894	60	200
Hogs	17,619	31,519	146	748	6,404	11,755	10,598	14,877	408	2,221	63	1,918
Sheep	5,909	18,435	76	1,708	2,697	7,877	2,927	6,383	182	1,365	27	1,102
Total	40,539	93,109	642	6,198	14,990	42,197	23,006	34,716	1,704	6,425	197	3,573

time on the basis of type of vehicle. Just over 20 percent of both semitrailers and small farm trucks brought mixed loads to market while

35 percent of regular farm trucks, 12 percent of truck-full trailer combinations, and only 7 percent of the small pickup trucks were so loaded.

Length-of-Haul

During the survey, the enumerators recorded the loading point of each shipment of livestock to determine the distance traveled from farm to market. Since an analysis of length-of-haul as related to transit losses was not a major objective in this study, it was not necessary to positively determine the exact point of origin. It was essential that the information obtained be gotten entirely by observation without benefit of oral interview.

The origin point was determined, therefore, by one of two methods: (1) by observing the yard company's unloading receipt where possible, or (2) by observing the truck. Frequently the trucker's "base" was listed on his vehicle and in other cases the State licensing system was such that each county had a specific designation number or letter for registration purposes. Although this latter method is not exact, special checks conducted during the pretest indicated that the system of relating origin of shipment to county registration of the vehicle gave better than 90 percent accuracy.

This distance from the shipping point to market by the shortest and most practical route was computed and used as the basis of the length-of-haul for each shipment.

Because of the many origin or shipping points, number of markets, and resulting number of lengths-of-haul, a mileage block system was devised and the shipments coded on the basis of the actual length-of-haul as related to the appropriate mileage block. For example, a shipment that originated at a point 35 miles from the market would have been coded

for the mileage block covering lengths-of-haul under 50 miles while a shipment originating at a point 65 miles from the market would have been coded for the mileage block covering lengths-of-haul from 50 to 99 miles.

This type analysis provided information on the amount of actual over-the-road transportation that livestock is subjected to and also related it to the various types of vehicles used in moving the livestock. Tables 4 and 5 show the results.

Roughly 70 percent of the cattle, calves, and hogs and 50 percent of the sheep were transported less than 100 miles. For each of the species, a little more than half of these shipments originated at points at least 50 miles from the market. The remaining shipments of cattle, calves, and hogs were divided approximately as follows: 60 percent, 100 to 199 miles; 30 percent, 200 to 299 miles; and 10 percent, over 300 miles. The sheep shipments, however, were divided on the basis of about 5 percent of the remaining shipments moving over 300 miles with the balance almost equally distributed between the two shorter blocks--100 to 199 miles and 200 to 299 miles.

The primary observation concerning length-of-haul as compared to type of vehicle is that there is some relationship between size of vehicle and distance traversed. The two smaller categories, small and pickup trucks and pup trailers, were used only to a limited extent for moves over 200 miles. And, even between these two types of vehicles, the larger were

TABLE 4.--PERCENTAGE DISTRIBUTION OF TOTAL LIVESTOCK RECEIPTS BY SPECIES FOR VARIOUS LENGTHS-OF-HAUL AT EIGHT PUBLIC STOCKYARDS, SEPTEMBER-DECEMBER 1956

Miles hauled	Species			
	Cattle	Calves	Hogs	Sheep
Percent				
0-49	33	34	30	22
50-99	37	37	41	27
100-199	16	17	15	23
200-299	10	8	9	23
300 and over	4	4	5	5
	100	100	100	100

TABLE 5.--PERCENTAGE DISTRIBUTION OF VARIOUS TYPES OF MOTOR VEHICLES USED TO TRANSPORT LIVESTOCK DIFFERENT DISTANCES TO EIGHT PUBLIC STOCKYARDS, SEPTEMBER-DECEMBER 1956

Miles hauled	Type of vehicle				
	Truck and full trailer	Semi-trailer	Straight truck	Small truck	Pickup truck or "pup" trailer
Percent					
0-49	54	26	41	47	67
50-99	12	38	39	34	25
100-199	9	18	16	12	6
200-299	19	13	3	6	1
300 and over	6	5	1	1	1
	100	100	100	100	100

used a proportionately greater number of times on the longer hauls.

For what might be termed long-haul shipments, the truck and full trailer combination and semitrailers were the only types of vehicles employed to any appreciable extent. The high percentage of the largest type vehicles--truckfull trailer combinations--used on the shortest hauls (those

under 50 miles) is accounted for by a substantial movement of "cull" dairy cows from nearby dairy farms to one western market. The local laws permit the use of this particular type of vehicle. Apparently, commercial truckers in this area find it better suited to their needs and are able to perform their work more efficiently and economically with it.

Number of Animals in a Load

There is no specific answer to the question, "How many animals make a load?" Size of the vehicle (that is the available floor space in the bed or box), weight of the animals, species, weather conditions, length-of-haul, and other factors all have a bearing on determining the number of animals that can be loaded into a truck or trailer safely and properly.

Experiences of those who regularly handle livestock indicate that what might be termed a "fairly snug" load is usually best under most conditions. These experiences, buttressed by evidence marshalled in various test load shipments, also point to a strong correlation between bruising, crippling, and death and overcrowding and/or light, shifting loads.

Some guides or standards useful in making a basic decision on the number of animals to load are available. The Western Weighing and Inspection Bureau, Chicago, Livestock Conservation, Inc., Chicago, a few major railroads, and others have published such information. Recommendations made by these organiza-

tions consider primarily floor space and animal weight on a species basis.

Other factors already noted are of such variability that no generalization can be made with two possible exceptions: (1) load a little lighter in hot weather, and (2) in the case of double-deck loads, put slightly fewer animals on the top deck.

In conducting this survey, the general guides suggested by the organizations mentioned were the basis for deciding whether to classify a particular vehicle as properly or improperly loaded. In addition, weather prevailing at time of receipt at the market, distance the shipment traveled, and other factors--particularly ventilation and bedding--were considered. Obvious overcrowding and trucks so loosely loaded that animals shifted around and were thrown off balance were designated as improperly loaded.

About one-fourth of all the vehicles observed were improperly loaded (table 6). Instances of light or shifting

TABLE 6.--COMPARISON OF PROPER AND IMPROPER LIVESTOCK LOAD FACTORS AT EIGHT PUBLIC STOCKYARDS, SEPTEMBER-DECEMBER 1956

Type of load	Properly loaded	Improperly loaded		
		Obviously overcrowded	Light or loosely loaded and shifting loads	Total
Percent				
All cattle	77.94	9.72	12.34	22.06
All calves	70.20	9.93	19.87	29.80
All hogs	72.15	8.85	19.00	27.85
All sheep	84.70	8.22	7.08	15.30
Mixed species	72.72	9.65	17.63	27.28
All loads	75.58	9.48	14.94	24.42

loads were half again as numerous as cases of obvious overcrowding. There was, however, some variation from these overall figures from species to species. Vehicles containing sheep alone were properly loaded almost 85 percent of the time while straight loads of calves were classified as properly loaded in only 70 percent of the cases observed. Overcrowding was also the reason for loads of sheep being

termed "improperly loaded" to a slightly greater extent than was light loading.

Light or shifting loads ranged from about 7 percent to almost 20 percent of total loads, depending on species. The number of loads obviously overcrowded, however, was relatively constant for all species and mixed loads as well -- ranging over 8 and under 10 percent.

Bedding and Bed Conditions

Various materials are generally spread over the floors of vehicles used in transporting livestock. This material, or bedding, is primarily intended to help animals maintain their footing. It may also be used to keep the livestock more comfortable during extreme weather conditions. When the vehicle is frequently used for other purposes than hauling livestock, using more absorbent types of bedding often simplifies cleaning out the truck bed and keeping it more sanitary.

The most common types of materials used as bedding are clean sand, straw, sawdust, and wood shavings. These were the materials observed in about 75 percent of the vehicles in this survey. In many instances these materials were used in combination -- the most frequent being straw placed over sand. Other materials used as bedding on some of the trucks included cornhusks, ground corn cobs, leaves, waste insulating material, and ordinary dirt or soil. A limited number of trucks containing no bedding whatsoever were equipped with special aluminum floors with a so-called "no slip" tread design. Operators of these trucks claimed that the tread design plus the fact that the aluminum attained an adhesive-like quality when wet with urine made use of bedding unnecessary.

Vehicles observed during this survey were classified as properly or

improperly bedded. Trucks with an adequate amount of extraneous material applied to the floor to provide good footing were classified as properly bedded. Where a skimpy amount of material was applied, or where there was no material added at all, the bedding was designated as improper. The special aluminum floored vehicles just mentioned (and there were only half a dozen of these observed) were not classified as it has not yet been fully established that this type floor eliminates need for bedding under all conditions.

About 72 percent of the vehicles were classified as bedded, 28 percent as improperly bedded, and 5½ percent had no bedding at all. Although the frequency of improper bedding was not radically different among the various vehicles on the basis of type load (table 7), there was a wide variation in such incidence on the basis of vehicle type (table 8).

The relatively large percentage of pickup trucks with no bedding or inadequate amounts is explained by the fact that these trucks usually travel a short distance, bring only a few animals, and are often used by farmers who raise a few animals as a sideline to other farm operations.

There was no real explanation for the high percentage of "truck and full trailer" combinations that were

TABLE 7.--BEDDING AND BED CONDITION OF VARIOUS TYPES OF LOADS OF LIVESTOCK AT EIGHT PUBLIC STOCKYARDS, SEPTEMBER-DECEMBER 1956

Bedding and bed condition	Mixed loads	Straight (single species) loads			
		Cattle	Calves	Hogs	Sheep
Percent					
Improperly bedded:					
Skimpy bedding	27.7	22.4	22.7	18.1	20.1
No bedding	4.5	4.6	9.6	8.3	18.1
	32.2	27.0	32.3	26.4	38.2
Properly and adequately bedded	67.8	73.0	67.7	73.6	61.8
	100.0	100.0	100.0	100.0	100.0
Vehicles arriving with ex- tremely slippery floors	10.4	11.4	7.4	1.5	0.6

TABLE 8.--BEDDING AND BED CONDITION OF VARIOUS TYPES OF LIVESTOCK TRUCKS TRANSPORTING BOTH SINGLE SPECIES AND MIXED LOADS TO EIGHT PUBLIC STOCKYARDS, SEPTEMBER-DECEMBER 1956

Bedding and bed condition	All vehicles	Type of vehicle				
		Truck and full trailer	Semi- trailer	Straight truck	Small truck	Pickup truck or "pup" trailer
Percent						
Improperly bedded:						
Skimpy bedding	23.0	54.6	14.6	25.2	22.8	22.5
No bedding	6.2	1.2	.8	5.8	7.8	18.3
	29.2	55.8	15.4	31.0	30.6	40.8
Properly and adequately bedded	70.8	44.2	84.6	69.0	69.4	59.2
	100.0	100.0	100.0	100.0	100.0	100.0
Vehicles arriving with extremely slippery floors	8.7	41.2	6.7	9.8	6.5	2.3

improperly bedded. These were all commercial vehicles operated by full-time livestock haulers transporting cattle to a west coast market. Although the largest number of these shipments were for short distances, many came from points several hundred miles from the market.

Particular note was made of those vehicles arriving with extremely slippery floors. Some of these trucks had skimpy bedding while others had only bare floors. This slippery floor condition was especially noticeable

among the truck and full trailer combinations. The condition was also most prevalent in loads of cattle and in mixed loads. Larger animals and skimpy or non-absorbent bedding may well serve as the reason for the slippery floors.

A major factor in providing animals with good footing is proper maintenance of the truck bed. Not only should the flooring be sound, but the bed should be cleaned out as often as may be necessary. Slippery floors are inevitable unless this is done.

Partitions

Loads of livestock trucked to market are often partitioned for one reason or another. The partition may be used to separate animals with different owners who have combined their shipments. A more equal distribution of the animals in the truck as well as a safer pattern of loading to eliminate shifting may also be achieved by partitioning. Bulls and horned animals are less likely to injure other cattle in the truck if they are isolated by partitions.

The principal use of partitions, however, is to avoid commingling species in mixed loads. All these uses except the first one cited are possible ways of reducing injury to the animals.

The trucks in this study were checked to ascertain whether or not partitions were used, and, if so, the apparent reason for using them. Results of these observations are shown in table 9. The greatest use of partitions was made in mixed loads and

TABLE 9.--USE OF PARTITIONS IN TRUCK LOADS OF LIVESTOCK AT EIGHT PUBLIC STOCKYARDS, SEPTEMBER-DECEMBER 1956

Use of partitions	Mixed loads	Straight (single species) loads			
		Cattle	Calves	Hogs	Sheep
Percent					
Vehicles not partitioned	49.7	73.5	85.9	88.9	77.5
Vehicles using one or more partitions	50.3	26.5	14.1	11.1	22.5
	100.0	100.0	100.0	100.0	100.0
Purpose of partitions used:					
Separate species	67.8	--	--	--	--
Segregate horned animals	1.0	1.3	--	--	--
Isolate bulls	2.3	2.0	--	--	--
Aid in proper loading	28.9	96.7	100.00	100.00	100.00
	100.0	100.0	100.00	100.00	100.00

in loads containing only cattle -- the types of loads where partitions have the greatest number of possible uses.

The significant finding was that only half the mixed loads were partitioned, and of these, only two-thirds used partitions to separate the various species. Of almost equal importance was the fact that while above 20 percent of the straight loads of cattle contained horned animals, just over 1 percent of these trucks made use of partitions to isolate them.

One important factor in the use of partitions to separate species in mixed loads is the stockyard company policy in receiving the livestock. In those markets where the various species must be unloaded at different points (cattle one place, hogs another,

and the like) partitioning was the general rule. On the other hand, if the yard company permitted the entire lot to be unloaded at a single point, the species were usually commingled.

Each of these systems has a certain advantage -- partitions aside. The first is more efficient for the yard company while the latter is easier for the man unloading the livestock. But reducing injuries by using partitions to separate the various species should induce the livestock owner to use them, regardless of the yard company policy. The little extra time needed to insert partitions at loading time and the few added minutes to remove them when unloading constitute a small premium for insuring against possible loss and damage caused by commingling the animals.

Horns

Since horned animals sometimes damage other animals in the load, the teams watched how frequently such animals appeared in truckloads of cattle and in mixed loads arriving at the markets included in this survey (table 10).

While an actual count of the number of horned animals in each truck was not possible, an attempt was made to indicate them. Accordingly, these classifications were used: one -- a single horned animal observed; few -- more than one but not more than about one-fourth of all cattle in the load; many -- more than a fourth of the cattle in the load had horns.

About 26 percent of all straight loads of cattle and almost 21 percent of all mixed loads which included any cattle at all contained one or more horned animals. There were only a few percentage points variation among the eight markets in the number of straight loads with

horned cattle, but the percentage of mixed loads with horned animals ranged from about 5 up to 40 percent.

This wide range in mixed loads reflected the geographical location of the markets. Markets located in range areas or those receiving large volumes of range livestock had high percentages of mixed loads with horned cattle. Markets where the cattle included in mixed loads was primarily dairy stock had low percentages of mixed loads with horned animals.

Results of this analysis indicated that while there were not too many loads with more than one-fourth of the animals horned, the number of loads with more than one horned animal were considerable, especially in the case of larger vehicles. Certainly this survey indicated that the problem of horned animals as a potential cause of injury in transit is still present.

TABLE 10.--PERCENTAGE OF TOTAL VEHICLES OF VARIOUS TYPES TRANSPORTING ONE OR MORE HEAD OF HORNED CATTLE TO EIGHT PUBLIC STOCKYARDS, SEPTEMBER-DECEMBER 1956

Horned animals	All vehicles	Type of vehicle				
		Truck and full trailer	Semi-trailer	Straight truck	Small truck	Pickup truck or "pup" trailer
Percent						
One horned animal in load:						
Mixed loads	9.5	9.5	8.4	8.4	15.9	22.9
All cattle loads	10.8	1.5	7.8	11.5	16.4	15.7
Few horned animals in load:						
Mixed loads	9.1	4.8	12.7	8.3	9.3	2.9
All cattle loads	11.2	18.7	12.4	11.7	7.0	4.5
Many horned animals in load:						
Mixed loads	2.1	--	3.7	1.9	1.3	--
All cattle loads	4.1	9.7	3.9	4.3	4.0	0.5
Total mixed loads	20.7	14.3	24.8	18.6	26.5	25.8
Total all cattle loads	26.1	29.9	24.1	27.5	27.4	20.7
All loads	46.8	44.2	48.9	46.1	53.9	46.5

End Gates

Many people in the meat industry feel strongly that many of the hip, shoulder, rib, and other bruises found on the carcasses of animals after slaughter may be due to animals injuring themselves by knocking or banging against the end gates of the truck, particularly during unloading. Frequently the animals crowd and push to get out of the truck, thus jamming the exit. Since a majority of these are only wide enough to permit a single animal to leave the truck at a time, and many end gates are so constructed that open angle irons surround the frame completely, the sides of the animal are subjected to bruise damage by forcible contact with the door frame.

A possible solution to the problem is to widen the end gates--perhaps enough to cover the entire width of the truck. Livestock haulers, however, contend that the narrow end gate is almost mandatory for efficient loading. Some attempts to resolve what appears an impasse have been made. A few vehicles observed were constructed so that the full width of the truck could be opened for unloading while a narrow opening could be formed for use during the loading operation.

Observations were made during the survey to determine how often the two types of end gates and the open angle irons were used (table

11). The results indicated that, except for pickup trucks, narrow end gates were almost universal since 84 to 94 percent of the vehicles were so equipped. The open angle iron was

rather widely used with the narrow end gate but not often with the wide end gate except for the large two vehicle truck and full trailer combination.

TABLE 11.--TYPE OF END GATE ON VARIOUS TYPES OF LIVESTOCK VEHICLES AT EIGHT STOCKYARDS SEPTEMBER-DECEMBER 1956

End gate type	Truck and full trailer	Semi-trailer	Straight truck	Small truck	Pickup truck or "pup" trailer
Percent of vehicles					
Narrow	25.3	55.4	51.5	62.9	12.5
Narrow-exposed angle irons	60.4	38.6	40.0	21.1	15.1
Total narrow	85.7	94.0	91.5	84.0	27.6
Wide	7.4	4.8	7.5	15.1	64.6
Wide-exposed angle irons	6.9	1.2	1.0	0.9	7.8
Total wide	14.3	6.0	8.5	16.0	72.4
Total	100.0	100.0	100.0	100.0	100.0

Handling Abuses

One of the most important factors in determining whether or not livestock are transported safely is the action of the people directly concerned with moving animals. This is particularly true of the handling practices of truck drivers or others charged with unloading the animals at their destination. Although occasionally animals crowd and rush voluntarily, most shipments will virtually "unload themselves" in a leisurely fashion if left alone. But such is seldom the case, either because the trucker desires to complete the delivery quickly for personal reasons or because he is pressed to expedite unloading so that other trucks can get to the unloading dock. In any event, most shipments of livestock are "assisted" in leaving the truck.

The "assistance" was usually in the form of a blow or prod from a persuader used by the trucker. Canes, whips, electric prods (or "Hot Shots"), canvas slappers, and miscellaneous sticks and clubs are the usual persuaders. During this survey such persuaders as burlap bags, iron rods, brooms, shovels, steel wire, screwdrivers, broken slats, and belts were used. And a favorite method of urging animals, especially the smaller species, to hurry from the truck was simply to kick them. Where the double-deck was used in a truck, the animals on the upper deck were often "assisted" in jumping down rather than helped down with a properly sloped rampway.

For this survey, excessive, persistent, or vicious use of persuaders,

any undue hurrying of animals, kicking animals or forcing them to jump from upper decks were considered as "handling abuses." Frequency of these abuses as well as the cases where animals slipped and fell as a result of being hurried off the truck was noted. Table 12 shows these observations.

Over half the straight loads of hogs were victims of handling abuse during unloading. About 40 percent of the total mixed loads and 26 percent of the straight loads of cattle were also subjected to such abuses. Sheep

and calves fared better--only about 17 percent of the total unloads were abused.

The percentage times each type of persuader and other abuse were observed is shown in table 12 -- both on the basis of total vehicles and of only those vehicles where handling abuses were observed. Many times two or more persons had a hand in the unloading operation, and frequently the persuaders used would not be the same for each man. In such cases, each type of persuader was recorded, if used in an abusive manner.

Losses

During this survey, a record was kept of all dead and crippled animals arriving at various markets in the trucks observed. By counting 4 cripples as equal to 1 dead, and relating the number of dead and cripples to total number of head of each species, the combined dead and cripple loss per 10,000 head shown in table 13 was derived.

While these loss figures varied to some extent on a species basis from those established in the earlier Farmer Cooperative Service study,¹ the total loss for all species combined was only about 15 percent higher on a dollars and cents basis. The fact that one market in the earlier study did not report dead animals not disposed of by the yard company explains the higher figure in this study. In this survey all deads were included whether handled for final disposition by the yard company or the trucker.

While the loss rates based on total receipts were high enough, the rates derived from only those trucks containing dead and/or crippled animals

were much higher. They are presented in this report to emphasize the significance of even one dead or cripple in a load of livestock. As an example, cattle losses ranged in number from 5.06 for all receipts to 269.27 for those trucks with dead or crippled animals in them.

One of the most interesting findings in the survey was the fact that only 3.43 percent of the total vehicles observed accounted for all the dead and cripple losses (table 14). This percentage varied considerably among the various markets surveyed as well as on the basis of type of load (mixed loads versus single species loads of the several species). Those markets where mixed loads and/or loads of sheep were numerous had higher percentages of the total vehicles with dead and/or cripple losses. If nothing else, the concentration of losses in such a relatively small number of vehicles supports the belief that livestock can be hauled safely if proper care is taken.

An analysis of those loads of livestock with dead and/or crippled animals showed that almost 93 percent of these were identified with one or more of the "loss associated conditions" described on page 20.

¹Rickenbacker, Joseph E. Losses of Livestock in Transit in Midwestern and Western States, Marketing Research Report 247. Farmer Cooperative Service, U. S. Department of Agriculture.

TABLE 12.--USE OF PERSUADERS AND OTHER HANDLING ABUSES OBSERVED IN UNLOADING TRUCK LOADS OF VARIOUS SPECIES OF LIVESTOCK INCLUDING MIXED LOADS AT EIGHT PUBLIC STOCKYARDS, SEPTEMBER-DECEMBER 1956

Abuses at unloading	Mixed loads	Straight (single species) loads				
		Cattle	Calves	Hogs	Sheep	
Percent of trucks						
Unloads not involving handling abuse	59.9	74.1	83.1	48.3		83.0
Unloads where handling abuse was noted	40.1	25.9	16.9	51.7		17.0
	100.0	100.0	100.0	100.0		100.0

	Total loads	Loads with abuses	Percent of trucks				Total loads	Loads with abuses	Total loads	Loads with abuses
			Total loads	Loads with abuses	Total loads	Loads with abuses				
Abuses:										
Canes	9.9	24.8	4.7	18.0	1.6	9.4	8.7	16.8	5.1	30.0
Prods	19.4	58.3	6.9	26.5	1.9	11.3	21.0	40.8	0.9	5.0
Whips	4.2	10.3	5.9	22.7	5.1	30.2	3.3	6.4	0.3	1.7
Slappers	1.0	2.5	0.7	2.6	0.6	3.8	1.7	3.2	1.1	6.7
Other persuaders	2.3	5.8	0.6	2.5	1.0	5.7	2.7	5.2	5.9	35.0
Hurrying animals	3.2	9.8	3.8	14.5	2.6	15.1	3.4	6.6	0.9	5.0
Kicking animals	3.6	8.9	2.5	9.5	1.9	11.3	15.3	29.6	2.3	13.3
Jumping animals from upper decks	0.2	0.4	--	--	--	--	0.5	0.9	1.4	8.3
Instances of loads where animals slipped and fell	2.9	7.3	1.7	6.5	1.9	11.3	0.8	1.6	0.3	1.7

TABLE 13.--COMBINED DEAD AND CRIPPLE LOSS PER 10,000 HEAD OF LIVESTOCK BY SPECIES,
AT EIGHT PUBLIC STOCKYARDS, SEPTEMBER-DECEMBER 1956¹

Losses	Cattle	Calves	Hogs	Sheep
Number				
Losses in total receipts	5.06	20.10	11.67	18.17
Losses in loads in which dead and/or crippled animals were present	269.27	271.31	114.68	73.68

¹ In combining dead and crippled animals, 4 cripples are treated as equaling 1 dead.

TABLE 14.--COMPARISON OF LOADS OF LIVESTOCK WITH INCIDENCE OF CRIPPLED AND/OR
DEAD ANIMALS AT EIGHT PUBLIC STOCKYARDS, SEPTEMBER-DECEMBER 1956

Type of load	All loads	Mixed loads	Straight (single species) loads			
			Cattle	Calves	Hogs	Sheep
Percent						
Loads in which no dead or crippled animals were present	96.57	93.46	99.22	99.36	96.03	88.70
Loads including dead and/or crippled animals	3.43	6.54	0.78	0.64	3.97	11.30
	100.00	100.00	100.00	100.00	100.00	100.00

The relationship was even greater in the case of mixed loads and straight loads of cattle and hogs. The rather unrealistic 50 percent for loads of calves (table 15) is probably explained by the fact that virtually all the straight loads of calves were made up of the sturdier "feeder" calves. The high calf losses were among young dairy calves, almost invariably included with other species in mixed loads.

Tables 16 and 17 present a more detailed analysis of the relationship between dead and cripple losses and these loss-associated conditions. In this analysis, the frequency of each loss-associated conditions is shown on the basis of percentage of loads containing deads and/or cripples where such condition was observed. Handling abuses and failure to use partitions when needed were the loss-associated conditions most often

TABLE 15.--RELATIONSHIP OF "LOSS ASSOCIATED" CONDITIONS TO DEAD AND CRIPPLE LOSSES
AT EIGHT PUBLIC STOCKYARDS, SEPTEMBER-DECEMBER 1956

Type of load	All loads	Mixed loads	Straight (single species) loads			
			Cattle	Calves	Hogs	Sheep
Percent						
Loads containing dead and/or crippled animals with no observed "loss associated" conditions	7.3	4.5	--	50.0	--	25.0
Loads containing dead and/or crippled animals with "loss-associated" conditions observed	92.7	95.5	100.0	50.0	100.0	75.0
	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 16.--PERCENT OF LOADS OF LIVESTOCK CONTAINING DEAD AND/OR CRIPPLED ANIMALS
THAT HAD IMPROPER LOADING OR HANDLING PRACTICES AT EIGHT PUBLIC STOCKYARDS,
SEPTEMBER-DECEMBER 1956

Practices	All "loss" loads	Mixed loads	Straight (single species) loads			
			Cattle	Calves	Hogs	Sheep
Percent						
Improper loading:						
Obviously overcrowded	25.0	28.6	30.4	50.0	23.3	17.5
Light and/or shifting	4.1	5.4	13.0	--	--	--
	29.1	34.0	43.4	50.0	23.3	17.5
Bedding:						
Inadequate (skimpy)	28.2	38.4	39.1	--	16.3	7.5
None	5.9	3.6	13.0	50.0	4.7	7.5
	34.1	42.0	52.1	50.0	21.0	15.0
No partitions where needed	45.5	35.7	60.9	50.0	60.5	47.5
Improper ventilation	25.0	30.4	13.0	--	25.6	17.5
Handling abuse	59.1	62.5	60.9	--	76.7	32.5

TABLE 17.--OCCURRENCE OF VARIOUS "LOSS-ASSOCIATED CONDITIONS" IN PERCENTAGES OF LOADS WITH DEAD AND/OR CRIPPLED ANIMALS AT EIGHT PUBLIC STOCKYARDS, SEPTEMBER-DECEMBER 1956

Number of loss associated conditions observed	All "loss" loads	Mixed loads	Straight (single species) loads			
			Cattle	Calves	Hogs	Sheep
Percent of total loss loads						
One	33.8	27.0	34.8	--	37.2	53.3
Two	35.3	42.1	17.4	--	32.6	30.0
Three	19.6	20.6	34.8	100.0	16.3	6.7
Four	10.8	10.3	8.7	--	13.9	10.0
Five	0.5	--	4.3	--	--	--
	100.0	100.0	100.0	100.0	100.0	100.0
Two or more	66.2	73.0	65.2	100.0	62.8	46.7

observed. But when all the loads with losses were considered, less than 25 percent of them had none of the loss conditions.

Furthermore, in about two-thirds of the cases two or more of these loss-associated conditions were present. The most frequent of these combinations were:

1. Failure to use partitions where needed and handling abuses.
2. Inadequate bedding and handling abuses.
3. Poor ventilation and handling abuses.
4. Failure to use partitions when needed, inadequate bedding, and handling abuses.

This survey was not designed to cover fully the relationship of length-of-haul to dead and cripple losses. In the first place, the survey was conducted at each of the markets for a 2-week period only -- certainly insufficient time to reach any real conclusion on this particular question. In addition, a detailed study of

this relationship was made in the previous Farmer Cooperative Service study mentioned in the footnote on page 16.

However, results in table 18 conform fairly well to the findings in the previous study; that is, losses increase as length-of-haul increases.

In looking at table 18, some exceptions will be noted. First, although hog losses increased up to 200 miles, they declined slightly in the next 100-mile block and then fell sharply for distances over 300 miles. This can be explained by the fact that the long shipments were largely observed at only one market and they moved under nearly ideal circumstances -- over smooth roads, under almost perfect weather conditions, and as direct shipments to packers. All these factors would help keep losses low.

We had a situation of dairy calves in the shorter haul blocks and feeder calves in the distance blocks over 200 miles. The cattle loss pattern was distorted to some extent largely because of the influence of receipts at two markets. These two markets

TABLE 18.--COMBINED DEAD AND CRIPPLE LOSS PER 10,000 HEAD AND PERCENTAGE OF DEAD AND CRIPPLED ANIMALS IN MIXED LOADS BY DISTANCE HAULED AT EIGHT PUBLIC STOCK-YARDS, SEPTEMBER-DECEMBER 1956¹

Distance hauled	Species				Percentage of total deads and cripples (all species) in mixed loads	Percentage of mixed loads in mileage blocks indicated
	Cattle	Calves	Hogs	Sheep		
Miles:						
Under 100	3.62	18.23	10.40	11.31	54.66	26.16
100-199	6.54	37.34	19.29	16.75	67.21	30.99
200-299	1.99	--	13.27	28.03	10.81	29.90
300 and over	33.55	18.58	3.29	46.61	35.00	26.67

¹ In combining dead and crippled animals, 4 cripples are treated as equalling 1 dead.

received large numbers of what might be termed "cull" dairy cattle. These animals usually came to market in mixed loads and frequently in vehicles that had many of the "loss-associated" conditions present. Since these shipments were usually received from origin points falling in the first two mileage blocks (0-200 miles), the loss rates per 10,000 head shown in table 18 were probably too high and not really representative.

This assumption would appear valid in light of the previous study based on 18 months' receipts at 10 markets and covering many more animals. In that study the loss rates for cattle moving less than 100 miles were found to be 2.80 per 10,000 head and 3.14 per 10,000 head where the

length-of-haul was from 100 to 200 miles.

Deads and cripples in mixed loads accounted for well over half the losses observed in vehicles moving under 200 miles. At the same time, mixed loads represented less than a third of the total vehicles involved. For distances over 200 miles, the losses in mixed loads were considerably less, although the ratio of the number of mixed loads to total vehicles remained about the same.

This pattern in mixed load losses is attributed to the high percentage of "cull" dairy cows and calves in the mixed loads moving short distances and their absence from mixed loads in the higher blocks.

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